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NOTES ON BAHAMA BATS.

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This is the second of a series of short papers based on material collected mainly during July, 1904, among the Bahamas. The writer, in company with Mr. Thomas Barbour and Mr. Owen Bryant, spent some ten days on the island of New Providence, and about three weeks among the northern islands of the Bahama group. Everywhere, inquiries were made that might lead to the discovery of bat colonies, but although many caves were visited which we were assured contained bats, only a few of these were found to be inhabited by them. The limestone rock of the Bahamas is quite suitable for cave formation. At several places, notably Hurricane Hole, Great Abaco, and Cedar Harbor, Little Abaco, there were series of rather open caverns in bluffs by the shore. These caverns varied in height from two or three feet to ten feet or more, often with curious cylindrical pits in their roofs. Others, again, were hollows in the ground of a more well-like nature, and sometimes led off at an angle from the opening. But not every cave is suitable as a resting-place for bats. In our experience a prime necessity of a bat cave is that it shall have a chamber sufficiently far from the entrance, or so situated past a turn, as to exclude all daylight. Apparently it is of less importance whether the entrance be in the side of a hill or burrow-like from a level surface. In several

cases we were informed that certain caves had been inhabited by bats for a great many years, indicating that they appreciate such places as are suited to their needs. On the island of New Providence, however, we made a journey into the interior to examine some caves on the large estate of Mr. Gladstone, Private Secretary of the Governor. This gentleman assured us that in March these caves were inhabited by numerous bats, and that he had visited them at that time with a party. But when we arrived, some four months later, not a bat could we find after careful search among the narrow passages leading back into the hill. Apparently no bats had been in the cave for some time, and we wondered if possibly it were inhabited at certain seasons only, by species that had migrated thither from elsewhere.

Six species of bats were collected by the members of our party. Although none of these are new, yet it is believed that the notes on their habits and distribution here offered may prove of value.

The bat fauna of the Bahamas is made up of elements somewhat similar in character to those composing the avifauna. Thus, the brown bat (*Vespertilio fuscus bahamensis*) is a representative of a North American species of wide distribution on the continent. The red bat (*Lasiurus borealis seminolus*) is also a representative of a wide-ranging North American species. On the other hand, there are species representing genera whose distribution is mainly the West Indies and the tropical and subtropical portions of the mainland. Such are the house bat (*Nyctinomus bahamensis*), the big-eared bat (*Otopterus waterhousii compressus*), and the straw-colored bat (*Chilonatalus tumidifrons*). A fourth species belonging to this second class is *Glossophaga soricina antillarum*, a skull of which has been recorded by Mr. J. A. G. Rehn from the Bahamas. A third class is represented by *Phyllonycteris planifrons*, which belongs to a genus apparently confined to the West Indies.

I wish to express my thanks to the authorities of the United States National Museum for the loan of specimens for comparison. All the bats collected by our expedition have been presented to the Museum of Comparative Zoology, Cambridge, Mass.

Following is a list of the six species obtained by our party, with notes :

Vespertilio fuscus bahamensis Miller.

Vespertilio fuscus bahamensis Miller. North Amer. Fauna, No. 13, p. 101, figs. 24 b, 25 b, 26 b. Oct. 16, 1897.

On June 29 we discovered a small colony of these bats in one of the underground chambers of old Fort Charlotte, at Nassau, New Providence. This is the type-locality for the subspecies, and we did not meet with it elsewhere. The bats were clustered in a cone-shaped cavity in the ceiling where the limestone rock of the dungeon had become broken away. They were not at all inclined to leave their retreat, but when disturbed simply endeavored to crawl still farther back into the cleft. By placing a net over the opening of this cavity we were able to dislodge a number into it with the aid of a pole. Of the 24 specimens preserved, 8 are adult males and 4 are adult females, 4 are young males and 8 are young females.

Lasiurus borealis seminolus (Rhoads).

Atalapha borealis seminola Rhoads. Proc. Acad. Nat. Sci., Phila., 1895, p. 32.

Lasiurus borealis seminolus Miller. North Amer. Fauna, No. 13, p. 109, Oct. 16, 1897.

? *Lasiurus borealis pfeifferi* (Gundlach) Miller. North Amer. Fauna, No. 13, p. 110, Oct. 16, 1897, Part.

A single female specimen of the Red Bat was captured by Mr. Bryant in the first week of August, at Nassau, where it had flown into a dwelling-house. The specimen was skinned out from alcohol after a two months' immersion and both skin and skull were then carefully compared with specimens of *L. b. seminolus* from Enterprise, Fla. The Bahama specimen is practically indistinguishable in color and proportions from the small, mahogany-red Florida race, and the skulls of the two also agree. When Mr. Miller wrote his Review of the Vespertilionidae of North America, he had but a single skull of the Red Bat from the Bahamas. This skull (from Nassau) he referred doubtfully to the Cuban subspecies, *L. b. pfeifferi*. Our specimen, however, seems referable to the Florida form.

Nyctinomus bahamensis Rehn.

Nyctinomus bahamensis Rehn. Proc. Acad. Nat. Sci., Phila., 1902, p. 641.

This bat was recently described by Mr. J. A. G. Rehn on the basis of specimens from the islands of Eleuthera and Little Abaco. We found a large colony at the latter island and a second at Marsh Harbor, on Great Abaco. In both these cases the bats had established themselves in buildings used as stores and roofed with fluted sheets of galvanized iron. The fluting offered small holes for entrance to the space left between the sheathing and the exterior of the building, and here the little creatures

were clustered in most cases quite beyond our reach. One or two individuals, however, I captured in my hands between the rafters and the roofing. Both colonies were visited during the daytime and seemed much awake, as a constant sharp chippering came from their quarter. Their musty odor, characteristic of this family of bats, as well as their continual ill-natured bickering drive the store-keepers to smoke them out at intervals. As many as 500 were said to have been smoked out and beaten down just previous to our visit to the Great Abaco colony. Notwithstanding this destruction, there seemed to be still a considerable remnant. One female specimen taken July 7, at Marsh Harbor, contained a large foetus nearly ready for birth. The bat colony at Little Abaco inhabited the space between the sheathing and the roofing at the store of Mr. Roberts. On the evening of July 10, shortly after sunset, I stationed myself outside the building to observe the animals as they came forth for their nightly foray. The squeaking and scrambling underneath the roof had now become much louder than before. As nightfall approached, the commotion grew more intense, and presently one or two bats swooped out from beneath the roofing and flew swiftly away into the dusk. Singly, or two and three at a time, from all sides of the building they now came forth and dispersed in different directions. Shortly after, a slight shower came on and with it a breeze, but although I watched until it was quite dark, a large number of the bats were evidently staying in their shelter, as evidenced by their squeaks and scratching. Mr. Roberts told me that he had sometimes observed them streaming back to their roost at a little before sunrise in the morning, and further, that on windy or rainy nights but few seemed to leave the shelter of the building.

In the series of 6 skins preserved there is a slight variation in color that appears to be correlated with sex, for the females are a uniform Prouts' brown, while the males are nearly a Broccoli brown.

***Chilonatalus tumidifrons* Miller.**

Chilonatalus tumidifrons Miller. Proc. Biol. Soc., Washington, vol. 16, p. 119, Sept. 30, 1903.

Mr. Miller has recently made known this delicately-formed species from four specimens collected July 12, 1903, at Watling's Island by the Bahama Expedition of the Geographical Society of Baltimore. It is with pleasure, therefore, that we are able to report it from a second locality, Great Abaco, thus extending the known range some 200 miles northwest, to the northern islands of the group. Our colony inhabited a cave at Israel's Point, on the northeastern shore of the island. The entrance to this cave was through a narrow sloping passage, leading down with a slight turn to a small underground chamber some eight feet high, and quite dark. Here, on July 7, I estimated that about 300 bats were hanging from the rough limestone of the sides and roof of the cave. As my guide and I entered with our lantern, those nearest at hand began to flit back and forth keep-

ing up a faint twittering, and finally alighted again in the more distant parts of the cavern. A few retreated through a small crevice which doubtless led into a second chamber. I noticed repeatedly that as the bats alighted they at first clung to the rock with both hind feet, but after obtaining a secure hold, they let go one foot, and hung suspended by one slender limb only. Of the 56 specimens captured, all were males, a fact which indicates that, as with many species of bats, the sexes segregate when not breeding, and that this was a male colony. After the bats had quieted down, I made as careful an examination as possible, and was unable to discover any other species in the cave save for two male specimens of *Phyllonycteris planifrons*. Some two weeks later while returning from our cruise among the northern cays, we again stopped in at Israel's Point and I made a second visit to the cave. To my surprise not one of the little *Chilonatalus* could be found, but instead a colony of from one to two hundred *Phyllonycteris planifrons* was in undisputed possession. The meaning of this I was unable to learn. According to my guide this cave had been discovered some twenty years or more ago when the ground had been in use as a pineapple plantation. It had always been used by the bats so far as he knew and was visited periodically by the planters in order to procure the guano as well as the cave earth that washes in.

Our specimens agree precisely with the original description as given by Mr. Miller. Two types of coloration were noticeable, however, due perhaps to age, for a number of the specimens, though adult, had not acquired the bright yellowish tint but were nearly drab above with the hairs lighter at their bases.

Otopterus waterhousii compressus (Rehn).

Macrotus waterhousii compressus Rehn. Proc. Acad. Nat. Sci., Phila., 1904, p. 434.

The Bahama *Otopterus* has been recorded from Andros, Long Island, New Providence, and Eleuthera. It has not yet been taken, apparently, among the northern islands of the group. We found but a single colony. This was at Nassau, New Providence, and must have numbered some seventy-five or more individuals. They occupied a portion of the ceiling in one of the underground dungeons cut in the limestone rock at Fort Charlotte. All the adults captured were females, and with these were a number of nearly full grown young of both sexes. In striking contrast to the sleepy brown bats in another chamber of the fort, these bats were alert and active. By the light of a broken lamp we could make out the colony hanging from the ceiling, some of them at least, holding on by one foot only. After once being startled they became very wild and dispersed throughout the chambers of the dungeon, flying from room to room, or back and forth between two chambers as we continued our exploration. Gosse, in writing of the Jamaican *Otopterus*, calls attention to its sub-

terranean propensities, and says that when living in houses, these bats invariably take up their abode in the cellar. We were interested to observe that none of these bats at the fort appeared to fly out into the light of day, but a number, on the contrary, retreated still farther underground after we had disturbed them. For when we had finished our examination our guide lowered his bucket into a well cut 103 feet deep in one of the underground chambers, and in so doing disturbed a number of the bats which had taken refuge at some depth in the shaft of the well. They emerged singly from the narrow mouth of the shaft as the bucket progressed downward. Several of these bats which we had taken alive were carried to our hotel. At frequent intervals they uttered a short sharp trill, very similar to the sound produced by rapidly running up a squeaky curtain-roller.

The young bats were much darker than the adults, almost a clove-brown on the back, and their faces were almost without hair.

Specimens.—7 adult females and 1 young male (skins); 2 adult females, 6 young males, and 2 young females (alcoholic).

***Phyllonycteris planifrons* Miller.**

Phyllonycteris planifrons Miller. Proc. Biol. Soc., Washington, vol. 13, p. 34, May 29, 1899.

This is a common species in the Bahamas. It was described five years ago by Mr. Miller on the strength of 124 specimens all from the same limestone cave a few miles from Nassau, New Providence. In addition to the colony at Israel's Point, Great Abaco, mentioned in connection with the colony of *Chilonatalus* we also visited a much larger one at Hurricane Hole, on the northeastern coast of Great Abaco. Here is a series of large open caves in a limestone bluff some 50 feet high or more. A small passage leads from the far end of one of these caves, and by means of this access is gained to a high vaulted chamber. A second and smaller chamber leads off from the first after turning a right angle. No ray of light penetrates these inner caverns. Everywhere our lantern disclosed hundreds of the *Phyllonycteris* clinging singly or in clusters to the walls and ceiling of the cave, and they were apparently the only species inhabiting it. I captured and examined a number of the bats. There were adults of both sexes in the cave, and many of the females had each a single young one still suckling, though about losing the last of the milk teeth. These young bats were very dark clove brown above becoming light drab below. A number of specimens were taken which showed various transitional stages of pelage from that of the young to a more mature stage having a curious patchy mixture of clove brown and vinaceous cinnamon above and drab beneath.

The colony at Marsh Harbor, visited July 20, also consisted of both sexes, but of the 18 specimens taken, only 2 were females. All the bats in this colony seemed to be adults.

As with some other species mentioned, many of these bats when at rest clung by one foot only. They are of a quarrelsome disposition and bite vigorously when handled. Their bickerings were audible even before we reached the mouth of their cave and it is evident that the colony, though resting, is much awake even in the daylight hours. A number of them were found to have one or both ears truncated near the tip in so regular a fashion as to make it seem that there were two types of ear-outline among them. The occurrence of some individuals with only one clipped ear, however, might indicate that this shape is due to accidental loss of the point of that organ through its having been bitten off by one of the quarrelsome company.

Specimens.—12 adult and 2 young males (skins) ; 3 adult females (skins) ; 4 adult females and 7 males (alcoholic), 2 young females and 2 young males (alcoholic).